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RESPONSE OF MARIANNA PLUM HARDWOOD CUTTINGS TO BASAL WOUNDING AND DIPPING PERIOD IN IBA SOLUTION

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ABSTRACT

This research was conducted at the College of Agricultural Science Engineering/ University of Sulaimani/ Kurdistan region- Iraq, to study effect of wounding at the base of cuttings and different dipping periods (10s, 20s and 30s) in 2500 ppm IBA solution on hardwood cuttings of Marianna plum during 2018-2019. The experiment was designed in RCBD, and Duncun's multiple ranges test (5%) was used for comparison of means. The studied parameters were rooting percentage, root number, root length, sprout bud number, shoot length and shoot diameter. Effect of individual factors revealed that wounding of basal end in hardwood cuttings gave no significant result for rooting percentage; wounded and unwounded cuttings gave %95.55 rooting. And also, quick dip of Marianna plum hardwood cuttings for different times (10, 20 and 30 seconds) in 2500 ppm IBA solution gave no significant result for any studied parameters; rooting reached 100% in cuttings dipped in 2500 ppm IBA for 20s. Interaction effects of the two factors showed no significant difference in rooting percentage. Rooting percentage reaches 100% in wounded and unwounded cuttings which were dipped in 2500 ppm IBA solution for 20s. The interaction effects on other root and shoot traits were not significant except in root length, the longest root (8.90 cm) found in cuttings were wounded and dipped in 2500 ppm IBA solution for 20s. Marianna plum is a species did not respond differently to basal wounding and quick dipping period in 2500 ppm IBA solution, as used for hardwood cuttings except in root length.

***KEYWORDS*:** wounding, IBA, Marianna plum, IBA dipping period, hardwood cuttings

INTRODUCTION

Marianna plum (*Prunus cerasifera* × *P. munsoniana*) is a rootstock used for grafting plum, almonds and apricots, however it isn't fully compatible with peaches and nectarines (Zarrouk *et al*., 2006). The importance of Marianna plum stocks for grafting *prunus* species arise from that they withstand heavy soils, poor drainage and adapted to different soil types (Westwood, 1993). Also, Marianna stocks tolerate oak root fungus and nematodes (Janick and Paull, 2008). Nevertheless, this rootstock has a variety of defects such as, producing more suckers, susceptible to bacterial canker and brown line virus (Edstrom *et al*., 1999 and Andersen *et al*., 2006).

Hardwood cuttings of Marianna plum are planted in fall root highly after treating with indole butyric acid IBA (Hartmann *et al*., 2011). The optimal concentration of IBA for hardwood cuttings of Marianna plum is variable, 1000 ppm (Swedan *et al*., 1993), 2500 ppm (Kracikova, 1996), or 3000 ppm (Kapetanovic et al., 1972). However, some aspects in relation to the auxin solution affect rooting of cuttings as well, such as time of dipping in the auxin solution. The first second was the time in which most auxin absorbed by Ivy (*protea*) cuttings in liquid form, and raped decreasing of auxin uptake observed with increasing dipping time (Gouws *et al*., 1990).

Wounding of the cutting bases is another factor induces adventitious root formation in cuttings. Heavily, callus and root are produced around the margins of basal wound of the

cuttings (Kasim *et al*., 2009). Also, wounding may allow the cuttings to take and absorb more water and applied rooting substances (Vera-Batista *et al*., 2002). Moreover, wounding give rise to breakage of anatomical obstacles that act as barrier for emergence of roots such as sclerenchyma rings (Puri and Shamet, 1988). De Klerk *et al*. (1999) described that wounding results releasing of wound-related compounds which they have important role in root formation. In this view, the objective of this research is to study effects of wounding and dipping time in IBA solution on Marianna plum hardwood cuttings.

MATERIALS AND METHODS

The experiment was carried out in the season (2018-2019), at the College of Agricultural Sciences/ University of Sulaimani /Kurdistan region- Iraq, to study effect of wounding and different dipping times in IBA solution on rooting hardwood cuttings of Marianna plum.

Hardwood cuttings were collected on 25 December in 2018 from the basal part of the shoots of three-year-old trees Marianna plum grown in a Kanpanka nursery. Immediately after collecting, the cuttings were cut with 20 cm long and 11-15 mm diameter. Then, the cuttings were divided into two groups, and each group included 45 cuttings, the basal end of the first group cuttings wounded deeply at bark surface with 1.5 cm long at two opposite sides, but the second group left unwounded. After wounding, each group (wounding and non-wounding) were divided into three other groups of 15 cuttings, and basal portions of each group separately treaded with 2500 ppm IBA, prepared in %50 ethanol, for 10, 20 or 30 seconds.

The treated cuttings were planted in sand medium in black polyethylene bags which were designed by RCBD in an uncontrolled greenhouse with three replications, in each replication 5 cuttings were planted. The cuttings covered with polyethylene sheet inside the uncontrolled greenhouse to protected from further lowering temperature during January and February. After 96 days on 1 April 2019, the experiment was terminated, and rooting percentage, root number, root length (cm), sprout bud number, shoot length (cm) and shoot diameter (mm) were measured. The data analyzed by XLSTAT program, Duncun's multiple ranges test (5%) was used for comparison of means.

RESULT AND DISCUSSION

The data in Table (1) revealed that wounding of basal end in hardwood cuttings of Mariana plum gave no significant result for rooting percentage; wounded and unwounded cuttings gave 95.55% rooting. Also, statistically, no significant differences were observed for other traits. These may be due to that Marianna plum is a species does not respond to wounding treatment. In this regard, Edwards and Thomas (1979) referred that plant species is a factor affects responding of cuttings to wounding treatment. Howard & Blasco (1979) indicated either apple root stock MM. 106 or MM. 111 were lesser responsive for wounding than M. 26. Moreover, Ruchala (2002) described basal wounding could not be considered as a beneficial factor in all conditions for cutting propagation, a correct reason for it cannot be presented as well.

Table (1): Effect of basal wounding on root and shoot traits in hardwood cuttings of Marianna plum

Wounding treatment	Rooting percentage	Root length (cm)	Root number	Number of bud sprout	Shoot length (cm)	Shoot diameter (mm)
Wounding	95.55 a	7.64 a	46.77 a	2.40 a	5.64 a	1.96 a
Non-wounding	95.55 a	6.59 a	44.31 a	2.66 a	6.29 a	1.99 a

* The values in each column with the same letter do not differ significantly ($P \leq 0.05$) according to Duncan's Multiple Range Test.

Data in Table (2) showed the effect of dipping period in 2500 ppm IBA solution on root and shoot traits in hardwood cuttings of Marianna plum. According to the results quick dip of Marianna plum hardwood cuttings for different periods (10, 20 and 30 seconds) in 2500

ppm IBA solution gave results, however there were no significant differences among them for any studied parameters. Whereas, rooting percentage reached 100% in cuttings were dipped in 2500 ppm IBA for 20s. These results emphasized the results of Meahl and Lanphear (1967) that they found little differences in cuttings dipped in IBA solution for 5s and those dipped for 160s (Blythe *et al*., 2007). Inversely, the results of this study did not support the rooting results in Ivy (*protea*) cuttings in which rooting decreased by increasing treatment time, from 1s to 30s, with IBA solution (Gouws *et al*., 1990).

Table (2): Effect of dipping time in 2500 ppm IBA solution on root and shoot traits in hardwood cuttings of Marianna plum

Dipping period in IBA solution (seconds)	Rooting percentage	Root length (cm)	Root number	Number of bud sprout	Shoot length (cm)	Shoot diameter (mm)
10s	96.66 a	7.03 a	50.53 a	2.43 a	6.04 a	2.07 a
20s	100 a	7.88 a	44.06 a	2.80 a	5.25 a	1.91 a
30s	90 a	6.44 a	42.03 a	2.36 a	6.61 a	1.94 a

* The values in each column with the same letter do not differ significantly ($P \leq 0.05$) according to Duncan's Multiple Range Test.

According to the data presented in Table (3), interaction effects of the two factors, wounding and dipping time in 2500 ppm IBA, caused no significant difference on rooting percentage, while rooting percentage reached 100% in wounded and unwounded cuttings which were dipped in 2500 ppm IBA solution for 20s. The unwounded cuttings which dipped in 2500 ppm IBA for 10s gave 100% rooting as well. Additionally, interaction effects of the two factors on other root and shoot traits were not significant except in root length, the longest root (8.90 cm) found in cuttings were wounded and dipped in 2500 ppm IBA solution for 20s, and the shortest root (5.88 cm) achieved in cuttings were not wounded and dipped in 2500 ppm IBA solution for 30s. These coincide with the results of Üçler *et al*. (2004) which summarized that rooting ability of semi-hardwood cuttings of Kiwifruit was not enhanced when they wounded and dipped for 5s and 15s in IBA. Also, Edwards and Thomas (1979) reports wounding did not affect percentage of rooting, but had effects on root quality.

Table (3): Interaction effects of basal wounding and dipping time in 2500 ppm IBA solution on root and shoot traits in hardwood cuttings of Marianna plum

Wounding treatment	Dipping time in IBA solution (seconds)	Rooting percentage	Root length (cm)	Root number	Number of bud sprout	Shoot lengrh (cm)	Shoot diameter (mm)
wounding	10s	93.33 a	7.04 ab	52.60 a	2.40 a	5.80 a	1.88 a
	20s	100 a	8.90 a	43.00 a	2.66 a	5.20 a	1.96 a
	30s	93.33 a	7.00 ab	44.73 a	2.13 a	5.93 a	2.03 a
Non-wounding	10s	100 a	7.02 ab	48.46 a	2.46 a	6.29 a	2.27 a
	20s	100 a	6.87 ab	45.13 a	2.93 a	5.30 a	1.85 a
	30s	86.66 a	5.88 b	39.33 a	2.60 a	7.30 a	1.86 a

* The values in each column with the same letter do not differ significantly ($P \leq 0.05$) according to Duncan's Multiple Range Test.

CONCLUSION

In conclusion, Marianna plum is a species has no significant respond to its hardwood cuttings toward basal wounding and dipping time in 2500 ppm IBA solution, except in root length.

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کاردانەوەی قەڵەمی دارینی هەڵوژەی ماریانا بۆ بریندارکردن لە بنکی قەڵەمەکەوە و وە ماوەی هەڵژەندنی لە گیراوەیIBA

ئەم توێژینەوەیە ئەنجامدرا لە کۆلێجی زانستە ئەندازیارییە کشتوکاڵیەکان/زانکۆی سلێمانی/هەرێمی کوردستان-عێراق، بۆلێکۆڵینەوە لەکاریگەری بریندارکردنی بنک و وە ماوەی هەڵژەندن لە گیراوەی 2500 بەش لەملیونێک IBA بۆ کاتی (10 و20 و30 چرکە) لەسەرقەڵەمی دارینی هەڵوژەی ماریانا، لە ساڵی 2018-.2019 وە توێژینەوەکە نەخشەکێشرا بەپێی RCBD، وەبەراوردکاری دنکن بۆ ئاستی 5% بەکارهێنرا لەشیکاری ئەنجامەکاندا. کاریگەری هەریەک لە هۆکارەکان بەجیا ئەوەیان پێشاندا کە ئەوقەڵەمانەی بنکەکانیان بریندارکران لەگەڵ ئەوقەڵەمانەی بریندار نەکران جیاوازیان نەبوولە هیچ یەک لە سیفەتە پێوانەکراوەکاندا، وە هەردووکیان 95.55% ڕەگیا درووست کرد. وە هەروەها کاریگە ری ماوەی هەڵژەندنی بنکی قەڵەمەکان لە گیراوەی IBA هیچ جیاوازیەکی درووست نەکرد لەنیوان ماوەجیاوازەکاندا (10 و20 و30 چرکە) بۆهیچ یەکێک لە سیفەتە پێوانەکراوەکان، وە 100% ڕەگگردن دەستکەوت لەو قەلەمانەی بۆ ماوەی 20 چرکە هەڵژەنران لە گیراوەی 2500بەش لەملیونێک.IBA کاریگەری هەردوو هۆکارەکە پێکەوە (بریندارکردنی بنکی قەڵەمەکان و ماوەی هەڵژەندن لە گیراوە2500 بەش لەملیونێک IBA) جیاوازنەبوولەسەر ڕێژەی سەدی ڕەگگردن، وە ڕێژەی سەدی ڕەگگردن 100% بوو لەو قەلەمانەی بریندارکران لەگەڵ ئەوقەڵەمانەی بریندار نەکران وە هەڵژەنران لە گیراوەی 2500 بەش لەملیونێک IBA بۆ ماوەی 20 چرکە. کاریگەری هەردوو هۆکارەکە پێکەوە تەنها جیاوازی درووست کرد لە درێژی ڕەگدا، وە دێژترین ڕەگ8.90) سم(لەو قەڵەمانەدا بوو کە بریندارکران وە هەڵژەنران لە گیراوەی 2500 بەش لەملیونێکIBA بۆ ماوەی 20 چرکە. هەڵوژەی ماریانا لەو جۆرانەیە کە قەڵەمەکانیان کاردانەوەی جیاوازیان نیە بۆ بریندارکردن لە بنکەکانیاننەوە وە بۆ ماوەی جیاوازی هەڵژەندن لەگیراوەی .IBA

أستجابة اقلام الخشبية للأجاص صنف ماريانة لتجريح القاعدة وغطس في المحلول IBA

اجريت الدراسة في الكلية الهندسة للعلوم الزراعية/ جامعة السليمانية في اقليم كردستان العراق لدراسة تأثير عملية التجريح لقواعد العقل وفترات (10، 20، 30 ثانية) التغطيس بمحلول منظم النمو IBA بتركيز 2500 جزء بالمليون على تجذير العقل الخشبية للأجاص ماريانا

(Marianna plum) خلال موسم 2081-2019. تم استخدام تصميم القطاعات العشوائية الكامل (R.C.B.D) وقورنت النتائج وفق طريقة دنكن متعدد المستويات على مستوى احتمال (5%) . أظهرت النتائج عدم وجود اختلافات معنوياً لكل من معاملة التجريح وفترات التغطيس (10، 20، 30 ثانية) على الصفات المدروسة. حيث اعطت العقل المجرحة والغير المجرحة نسبة تجذير 95.5% في حين أعلى نسبة تجذير 100% سجلت بتغطيس العقل بمحلول IBA لمدة 20 ثانية. التداخل الثنائي بين عملية التجريح وفترات التغطيس لم تؤثر معنوياً ايضاً على الصفات المدروسة باستثناء طول الجذر، وقد بلغ اطول جذر 8.9 سم للعقل المجرحة والمغطسة بمحلول IBA لمدة 20 ثانية. حيث تم الاستنتاج من هذه الدراسة ان النوع أجاص ماريانا (Marianna plum) لايستجيب للتجريح ولا الى التغطيس السريع في محلول منظم النمو IBA (2500) جزء بالمليون المستخدم في الكثير من العقل الخشبية.